REMARKS

After entry of this response, claims 1-39 remain pending. No claims have been added, and no claims have been amended.

1. *Claim Rejections – 35 U.S.C. § 102(b)*

Claims 1-4, 6, 8, 10-13, 15, 16, 18, 20, 21, 23, 26-32, and 35-39 have been rejected under 35 U.S.C. § 102(b) as being anticipated by Ogawa (U.S. Patent No. 6,100,538), and it is asserted that the present invention by Burns was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States. After reading the cited references and reviewing the Examiner's comments, the Applicant respectively disagrees with the Examiner's conclusions regarding each of these claims.

As to independent claims 1 and 31, the Examiner purports that Ogawa discloses a system for determining a stylus position of a stylus (2), comprising: a telemetric imager (detecting unit 3R, 3L of Figs. 1, 16) and a controller (circuit component 8 as shown in Fig. 2 constitutes processor means) electrically coupled to the telemetric imager (processor means incorporated in the detecting unit 3R and 3L; see col. 7, lines 27-28 and 47-51); wherein the controller determines the stylus position based on a generated image of a stylus tip from a first direction (from detecting unit 3L) and a generated image of the stylus tip from a second direction (from detecting unit 3R) when the stylus tip is in a stylus entry region (col. 7, lines 27-39 for example).

The Applicant wishes to call to the Examiner's attention certain substantive and functional differences between the optical digitizer of Ogawa and the telemetric imager of Burns.

For example, the optical digitizer of Ogawa has a detector, a processor, a collimator, a shield, and a light source, according to claim 1. Ogawa requires two detecting units disposed at separate corners of a coordinate plane to determine the position of a stylus (col. 6 lines 50-56). However, the system of Burns, which has a

telemetric imager and controller, requires only a single telemetric imager (see, for example, Fig. 1). The optical digitizer of Ogawa is not capable of determining the stylus position unless configured with a pair of separated detecting units. As described by Ogawa, the "digitizer is provided with detector means in the form of a pair of left-hand and right-hand detecting units 3L and 3R arranged around the coordinate plane" (col. 6, lines 50-52). Clarifying this further, "the pair of left-hand and right-hand detecting units 3L and 3R are arranged separately from each other by a predetermined distance in the horizontal direction over the coordinate plane 1. Each of the detecting units 3L and 3R receives the light projected from the stylus 2 to generate an electrical signal" (col. 7 lines 15-20; see also col. 9 lines 57-61 and col. 16 lines 32-39). It is considerably more attractive commercially to have only a single telemetric imager as in Burns, rather than to require a separated pair of detecting units as in Ogawa. The optical digitizer of Ogawa uses, for example, two linear image sensors, two collimators and two processors compared to just one imager and one processor of Burns. Furthermore, the approach of Ogawa requires two pre-positioned detecting units that reduce the geometric flexibility of the coordinate plane. (The Applicant notes that claim 1 and other claims of Ogawa do not recite a pair of optical detectors, so that as claimed, a single optical digitizer is unable to actually compute the position of the pointing object, since electrical signals from two optical detectors are needed to do the triangulation calculation). Additional discussions about the collimators, the shield and the light sources are found below.

Another substantive difference exists between the linear image sensors in the detecting units of Ogawa and the telemetric imager of Burns. Fig. 26 of Ogawa is a schematic diagram illustrating the function of linear image sensor 13. "As shown, the lens 9 is located between the light emitting-member 24 incorporated in the stylus and the linear image sensor 13. The light projected from the light-emitting member 24 is collected by the lens 9 to form an image formation point on the light receiving surface of the linear image sensor 13. The light receiving surface is linearly arranged with tiny picture elements. When the light-emitting member 24 moves from a first position PA to a second position PB, the corresponding image formation point moves from SA to SB" (col. 8 lines 57-66). The detector of Ogawa generates an electrical output signal from each of the optical digitizers based on a one-dimensional optical imaging array much like

the scanner in a grocery store checkout line, rather than generates images of the stylus tip as in Burns. As exemplified in Ogawa, "The left-hand detecting unit 3L and the right-hand detecting unit 3R include linear image sensors 13 that receive the light projected from the stylus 2 in different angles or bearings to generate electrical signals indicative of a one-dimensional linear image of stylus 2" (col. 7 lines 44-48). The detecting units of Ogawa do not form images of the stylus tip as in Burns. FIG. 9 of Ogawa illustrates a specific example of the linear image sensor 13 assembled in each of the detecting units 3L and 3R. "... the linear image sensor 13 has picture element cells 133 (charge accumulating devices) for accumulating an electric charge corresponding to light reception amount and for converting the accumulated charge into an electrical signal" (col. 10, lines 62-66).

In another embodiment of Ogawa shown in Fig. 16 and Fig. 17 that uses a color TV camera with a color image sensor in the detecting unit, "A lens 9 is mounted in the detecting unit 3 for limiting a view field 11 of the detecting unit 3 below a predetermined height relative to the coordinate plane 1 to make the range of receivable projected light parallel to the coordinate plane 1. ... The lens 9 has an optical axis vertical to the coordinate plane 1. A mirror 16 is arranged on the coordinate plane 1 as reflection means to reflect a projected light component parallel to the coordinate plane 1 at right angles to guide the reflected component to the lens 9. This constitution collects only the component of the light projected from a tip portion 22 of the stylus 2 onto a light receiving surface of the image sensor, thereby making the range of receivable projected light parallel to the coordinates plane 1" (col. 13, lines 44-60). Once again, only the component of projected light parallel to the coordinate plane 1 is collected, rather than an image of the stylus tip as in Burns.

The collimator requirement of Ogawa shows another important difference when compared with Burns. According to Ogawa, "It should be noted that each of the detecting units 3L and 3R incorporates collimator means for limiting a view field of the detecting unit to a predetermined width in the vertical direction from the coordinates plane 1 to make a range of receivable projected light parallel to the coordinates plane 1" (col. 6, line 65 to col. 7 line 3). The telemetric imager of Burns requires no collimators, whereas Ogawa requires two. According to Ogawa, "Each of the detecting units 3L and

3R contains a collimator lens constituted by a lens group 9, which converges only a parallel component of the light projected from the stylus 2 that is substantially parallel to the coordinate plane 1 onto a light receiving surface of the linear image sensor 13, thereby making the range of receivable projected light parallel to the coordinate plane 1" (col. 7 line 62 to col. 8 line 1).

The collimator of Ogawa, while effectively focusing light from the stylus that is substantially parallel to the coordinate plane, inhibits the generation of an image of the stylus. In other words, light from a pointing object in a region between the surface of the coordinate plane and a vertical distance approximately 1 cm above the coordinate plane (col. 7, lines 8-9) is collimated and converged onto a point along the linear image sensor. Light projected from a 1-2 cm portion of a vertically held stylus pressed against the coordinate plane is condensed down onto the linear imager resulting in a localized spot of light, not an image. Any light projected from a vertical portion of the stylus in this volumetric region focuses to a point on the linear imager so that the position of the stylus can be determined – in combination with a second detecting unit. The collimator or collimating lens group (see, for example, col. 7 lines 62-67 or col. 8 lines 6-8) as in Ogawa focuses light from a distance on the order of a centimeter or two in the height direction from the coordinate plane (col. 7, line 8) onto the linear image sensor, thus losing the ability to generate an image of the stylus. The telemetric imager of Burns, contrary to that of Ogawa, generates images of the stylus to determine the stylus position.

The collimator of Ogawa places constraints on the apparatus that are different and are overcome by Burns. The collimator is described as "of compact and laid type. The collimator lens is a wide-angle lens having an angle of about 90 degrees in order to widely cover the coordinates plane 1" (col. 8 lines 4-8). Still further, "the lens group 9 is made flat, so that the detecting units 3L and 3R can be made relatively flat as a whole. This allows the detecting units 3L and 3R to be mounted directly on the coordinate plane 1, thereby facilitating the adjustment of installation and positioning" (col. 8, lines 39-43). As shown in Fig. 3, "the lens group 9 is sliced at the top and bottom thereof into a flat shape, so that the lens group can be arranged on the coordinate plane in parallel [relation] thereto" (col. 9, lines 5-8; also col. 8 lines 1-4). The telemetric image of Burns need not be flat against the coordinate plane as in Ogawa, since the telemetric imager of Burns

need only generate images of a stylus tip when the stylus tip is in a stylus entry region. Ogawa offers alternative optical arrangements to positioning the detecting units directly on the coordinate plane. In one embodiment using a mirror, "The mirror 16 reflects the light projected from the stylus 2 and collected by the lens group 9 to guide the reflected light to the light receiving surface of the linear image sensor 13" (col. 8 lines 52-55 and Fig. 2). In another embodiment using a prism, "The prism 17 refracts the projected light collected by the lens group 9 to the light receiving surface of the linear image sensor 13" (col. 9, lines 13-15 and Fig. 4). "The prism 17 is arranged in the light path of the projected light from the lens group 9 to the linear image sensor 13 for bending the projected light" (col. 9, lines 19-21). These approaches of Ogawa require more components and are therefore more complex than Burns.

The triangulation method of Ogawa differs from that of Burns. As described in Ogawa, "the left-hand detecting unit 3L receives the light projected from the stylus 2 to generate an electrical signal indicative of left angular information, and sends the generated electrical signal to the right-hand detecting unit 3R. The right-hand detecting unit 3R receives the light projected from the stylus 2 to generate another electrical signal indicative of right angular information. Further, the processor means incorporated in the right-hand detecting unit 3R sends to the personal computer 5 the positional information indicative of the positional coordinates designated by the stylus 2 according to triangulation based on the left angular information and the right angular information together with distance between detecting units 3L and 3R" (col. 7 lines 21-33). "The right-hand detecting unit 3R also has processor means constituted by a circuit component, which computes right angular information based on the one-dimensional linear image supplied from the linear image sensor 13 and computes a two-dimensional positional coordinate of the stylus 2 based on the computed right angular information and the left angular information supplied from the left-hand detecting unit 3L" (col. 7, lines 54-62). The system of Burns determines the stylus position by comparing a first set of images and a second set of images from a telemetric imager using a controller electrically coupled to the telemetric imager.

The shield of Ogawa presents another distinctive difference from the present invention of Burns. The shield is used by Ogawa at the periphery of the coordinate plane

"to block out noise comprising light other than the projected light [from the stylus] from entering into the limited field of view of the detector means" (claim 1). As described by Ogawa, "shield means in the form of a shield frame 4 is arranged to enclose a periphery of the coordinate plane 1, the shield frame 4 being wide enough in the vertical direction for blocking undesired noise light other than the projected light away from the field of view of each of the detecting units 3L and 3R" (col. 7 lines 3-8). Elsewhere in Ogawa, "shield frame 4 arranged to enclose the coordinate plane 1 is made of a non-reflective cloth material to prevent undesired noise light other than the projected light from entering into a field of view 11 of the linear image sensor 13" (col. 8 lines 8-12; see also col. 10 lines 53-54, col. 13 lines 31-32, and col. 13 line 67 to col. 14 line 3). Burns needs no shield.

Another important distinction is that due to the collimating function of Ogawa, Ogawa is unable to determine the position of the stylus tip in the same way that the present invention of Burns does. Ogawa is only able to determine a 2-dimensional coordinate of the stylus, whereas Burns is able to determine a 3-dimensional coordinate of the stylus tip with the use of generated images by the telemetric imager. To illustrate this argument, imagine a person positioning one eye near the edge of a table or desk, and peering over the surface of the table or desk with a stylus in a writing position above the surface. Even when inside the collimated region of Ogawa, the location of a stylus cannot be distinguished without a second eye. Additionally, when a portion of the stylus is in the collimated region, another technique is required to tell whether the stylus is actually in contact with the surface or not. Another pitfall of the collimating function is that the electrical signal generated in the collimated region above the coordinate surface from a passive pointing object, such as a thumb, is smeared out over the width of the object or thumb, and positional accuracy is lost. Similarly, when the pointing object is at an angle, the position of the stylus on the coordinate plane is impacted by the angle at which the pointing object is held, further decreasing the positional accuracy. To help remedy these problems, Ogawa suggests the use of active pointers, such as stylus with an LED near the tip, or a colored stylus tip that is increasingly covered by an outer shroud of a different color while the spring-loaded stylus is depressed against the surface. As described by Ogawa, "stylus 2 incorporates a light-emitting member 24 such as an LED

and has a light guide member 23 at a tip end for forming a light point or bright spot. This light point stays in the collimated parallel view field 11 to be picked up by the linear image sensor 13" (col. 8 lines 14-18; see also col. 9 lines 28-50). In another version of a stylus by Ogawa, "stylus 2 has a holder portion 21 which is operated to perform a drawing operation and a thrust operation involving a change in writing pressure applied to the coordinate plane, and a tip portion 22 attached with a reflector that forms the light point by reflecting illumination light. This reflector has a slide member 28 having a first color (for example, blue) and sliding up and down in response to the writing pressure, and a cover member 29 having a second color (for example, red) and covering the slide member 28. As a ratio of the first color to the second varies with the writing pressure, this stylus can input pen pressure information in addition to positional coordinates information according to the drawing operation. It should be noted that a spring 28a is loaded in the holder portion 21 of the stylus 2 to realize up and down motion of the slide member 28 in response to the writing pressure" (col. 12, lines 46-61). ... "this writing pressure information can be used as a stylus pen down signal or a switch signal corresponding to a mouse click signal" (col. 13, lines 4-6). The need for an active stylus as in Ogawa is mitigated by the present invention since the telemetric imager of Burns determines the stylus position based on generated images. The latter is very attractive commercially because special styli with mechanical springs, shrouds, special colors, LEDS, batteries, switches and force-sensitive elements are not needed. Another example of this stylus complexity is found in Ogawa, "the stylus 2 is composed of a holder portion 21 and a tip portion 22. The holder portion 21 contains a printed circuit board 21p over which a switch 21s, a side knob 21n, and a circuit component 21c are mounted. The printed circuit board 21p has a writing pressure detector 21d" (col. 14 lines 21-26) ... from which "writing pressure information and switch on/off information are computed" (col. 14, lines 58-59).

As to claim 2, the Examiner asserts that Ogawa teaches that the stylus comprises a pointer (col. 1, line 9), which may also be a pointing object such as a finger, a stylus, or a pointing stick (col. 1, line 9-10). The Applicant wishes to convey that Ogawa neither teaches nor claims the pointer as a writing utensil such as pen, a pencil or a marker found in Burns. The telemetric imager of Burns has no requirements that prohibit the use of a

commercially available pen, pencil or dry-erase marker as the stylus. Since the telemetric imager of Burns determines the stylus position based on generated images of the stylus tip, the use of low-cost, readily available styli that can simultaneously write on paper or other medium makes the system of Burns attractive as a low-cost, readily accepted solution. The compact, ubiquitous writing utensils such as a pen or pencil also provide healthy alternatives to the muscle-splaying conventional computer mouse. The pointing devices of Ogawa with any of their active components are relatively complex compared to the stylus of Burns.

As to claims 3, 8 and 10, the Examiner asserts that Ogawa teaches a writable medium (element 1 in Fig. 1) in the stylus entry region. The Applicant could find no reference in Ogawa to a writable medium or to a writable medium positionable in the stylus entry region. Element 1 in Fig. 1 as cited by the Examiner references a coordinate plane that is part of a display panel 6 "constituted by a 42-inch plasma display panel (PDP) or liquid crystal display (LCD), and has a screen that superimposes on the coordinate plane 1 of the digitizer" (col. 6 lines 58-60). Furthermore, the apparatus of Ogawa has a "shield means in the form of a shield frame 4 arranged to enclose a periphery of the coordinate plane 1 … for blocking undesired noise light … is 1 cm to 2 cm for example in the height direction from the coordinate plane" (col. 7, lines 3-9). The shield means, not required in Burns, makes writing on a writable medium such as a sheet of paper or a pad of paper inside the shield frame difficult, at best. Additionally, there are no references in Ogawa to a stylus tip that allows for writing (see for example, Fig. 2, Fig. 5, Fig. 6, Fig 15a-c, Fig. 18, and text associated with Fig. 1, Fig. 13, Fig. 16, Fig. 17, Fig. 21, Fig. 22 and Fig. 23).

As to claim 4, the Examiner asserts that Ogawa teaches that the stylus includes a writing-mode imaging target near a writing end of the stylus (detecting the writing end touches on the plane 1, which reads on a writing-mode imaging target as claimed). The Applicant respectfully disagrees. In contemporary machine-vision applications, the use of an imaging target is recognized as means to rapidly and certifiably identify a particular object in the field of view. Ogawa makes no reference to such a target. Furthermore, as described above in the discussions regarding claim 1, the collimator of Ogawa compresses the light component that is parallel to the coordinate plane and focuses it to a

point on a portion of a linear imaging sensor, effectively eliminating any possibility of identifying an imaging target. Also as described above with respect to claim 1, touches of the pointer on the coordinate plane are detectable with a compression of a colored shroud around a differently covered pointer tip that changes the fraction of color sensed by the optical digitizer (col. 12 lines 46-61; also Fig. 15a-c), or by use of a writing pressure detector (21d in Fig. 18) in an active stylus. While Ogawa presents an approach to recognize the surface color of the pointer (Figures 11-14 and associated text), neither this approach nor compression of the colored shroud or a writing pressure detector constitute an imaging target as in Burns.

As to claim 6, the Examiner asserts that Ogawa teaches that the telemetric imager comprises two optical imaging arrays (linear image sensors 13 as shown in Fig. 2 both detecting units 3L, 3R). The Applicant respectfully disagrees. The two optical imaging arrays of Burns, shown as elements 32a and 32b in Fig. 1, are co-located in telemetric imager 30, whereas the apparatus of Ogawa requires two optical detectors that are not co-located and are "arranged separately from each other by a predetermined distance in the horizontal direction over the coordinate plane 1" (col. 7, lines 16-18). In simplicity, compactness, flexibility and lower parts count, the invention of Burns offers appreciable commercial value compared to that of Ogawa.

As to claim 11, the Examiner asserts that in reference to Fig. 22, Ogawa teaches a light source (31) positioned near the telemetric imager (3), wherein light emitted from the light source illuminates the stylus tip when the stylus tip is in the stylus entry region. The Applicant wishes to point out that in the particular embodiment cited, "a half mirror 16h is used ... In the rear of this half mirror 16h, a light source 31 is arranged via a cylindrical lens 32. Via the half mirror 16h, the light source 31 illuminates a stylus 2" (col. 16, lines 12-16). The system of Burns has no requirement of a half-silvered mirror. The use of a half-silvered mirror increases costs and complexity. Additionally, Ogawa requires two light sources, one positioned near each of two detecting units placed apart (for example, Fig. 1, Fig. 6, Fig. 16, col. 7 lines 16-18, and others) to determine the two-dimensional coordinates of a pointer, whereas the invention of Burns requires only one light source located near the telemetric imager to illuminate the stylus tip and to determine the stylus

position. The reduction in cost and complexity of a single light source in the approach of Burns versus two light sources for Ogawa is advantageous commercially.

As to claims 12 and 13, the Examiner asserts that Ogawa teaches the light source comprising an LED (col. 10, lines 12-13). The Applicant reminds the Examiner that two such light sources are required for Ogawa, whereas only one is required for Burns. While Ogawa teaches use of red, green and blue LEDs to determine the color of a tip end of a pointing object, Ogawa does not teach other modulatable or unmodulatable light sources such as a laser diode, an infrared light-emitting diode, an infrared laser, a visible laser, an ultraviolet light-emitting diode, an ultraviolet laser, or a light bulb as does Burns.

As to claim 15, the Examiner asserts that in reference to Fig. 23, Ogawa teaches an optical filter (39) positioned between the telemetric imager and the stylus, and the optical filter preferentially passes light from the stylus tip to the telemetric image. While benefits of an optical filter are recognized by Ogawa and by Burns, the apparatus of Ogawa requires two such filters (39L and 39R) to determine the coordinates of a pointing device, one in the optical path of each detecting unit, whereas the invention of Burns requires only one such filter, if used at all.

As to claim 16, the Examiner asserts that in reference to Figs. 1, 21 and 24, Ogawa teaches a communication port connected to the controller to enable communication between the controller and a digital computing device (5). While connections with a personal computer is acknowledged by both Ogawa and Burns, the apparatus of Ogawa requires more than one communication port, as Ogawa requires two optical digitizers that are separated and require a communication port, as well as a second one to the PC. As found in Ogawa, "A circuit component 8 mounted on a printed circuit board assembled in the left-hand detecting unit 3L constitutes processor means, which generates left angular information based on the one-dimensional linear image supplied from the linear image sensor 13, and which sends the generated left angular information to the right-hand detecting unit 3R. The right-hand detecting unit 3R also has processor means constituted by a circuit component, which computes right angular information based on the one-dimensional linear image supplied from the linear image sensor 13 and computes a two-dimensional positional coordinate of the stylus 2 based on the computed right angular information and the left angular information supplied from the left-hand

detecting unit 3L" (col. 7 lines 48-62; see also col. 6 line 57 and col. 7 lines 15-36). The system of Burns only requires one communication port since it has a single telemetric imager, and only one processor versus the two processors of Ogawa.

As to claim 18, the Examiner asserts that Ogawa teaches that the telemetric imager and the controller are contained in a housing (see Fig. 2). While both Ogawa and Burns have housings, the apparatus of Ogawa requires two housings, one for each detecting unit, and it also requires a shield. The system of Burns requires only a single housing and no shield, reducing the complexity and cost of the device.

Claim 20 is a method claim corresponding to the above apparatus claim 1, and has been rejected by the Examiner for the same reasons as stated above, since such method "steps" are clearly read on by the corresponding "means". For the same reasons as described above regarding claim 1, the Applicant respectfully disagrees with the Examiner, and refers to those arguments.

As to claim 21, the Examiner asserts that Ogawa teaches that the telemetric imager comprises two optical imaging arrays (linear image sensors 13 as shown in Fig. 2 both detecting units 3L, 3R). As discussed extensively above, the Applicant respectfully disagrees. To compute the coordinates of a stylus as in Ogawa, two detector units are required whereas only one telemetric imager is required for Burns. Secondly, with the linear image sensors 13 of Ogawa and the collimators of Ogawa, images of the stylus tip are not generated as they are in Burns, described in detail above with respect to claim 1 along with other differences. In one embodiment of Burns, the two optical imaging arrays are housed in one telemetric imager (see elements 32a, 32b and 30 of Fig. 1 and associated text).

As to claims 23 and 32, the Examiner asserts that with respect to Fig 22, Ogawa teaches illuminating the stylus tip with a light source (31) when the stylus tip is in the stylus entry region. The Applicant respectfully disagrees in that the invention of Ogawa requires two light sources (31), one in each detecting unit, whereas the invention of Burns requires only one light source (see, for example, element 60 of Fig. 1, Fig. 2 and Fig. 3).

As to claims 26, 27, 35 and 36, the Examiner asserts that Ogawa teaches determining angular information of the stylus (angle or rotation of the stylus) when the stylus tip is in the stylus entry region (col. 7 lines 27-32). The Applicant respectfully

disagrees. Closer inspection of Fig. 1 and the related text of Ogawa shows that the "left angular information and the right angular information together with distance between the detecting units 3L and 3R" (col. 7 lines 31-33) are used with triangulation to determine the location of the pointing object (see dashed lines in Fig. 1). This is not the same as angular information of the stylus described in Burns. In Burns, the stylus angle of the stylus refers to the angle of the stylus with respect to the stylus entry region, that is, what angle the stylus is elevated to from the stylus entry region or equivalently, how many degrees from normal the stylus is with respect to the stylus entry region. Similar confusion may exist regarding the meaning of stylus rotation. The stylus rotation described in Burns is the angle of stylus rotation. The angle of the stylus and the rotation of the stylus are particularly beneficial for styli that are used for calligraphy. (See, for example, paragraph 0069 of Burns).

As to claims 28 and 37, the Examiner asserts that Ogawa teaches a writable medium (1) in the stylus entry region. The Applicant finds no reference in Ogawa to either a writable medium in the stylus entry region or a stylus with a tip capable of writing on a writable medium. Element 1 in Fig. 1 of Ogawa, as cited by the Examiner, references a large-size plasma display panel or LCD (col. 6 line 58).

As to claims 29 and 38, the Examiner asserts that Ogawa teaches sending the determined stylus position to a digital computing device (personal computer 5). Both the system of the Applicant and the apparatus of Ogawa can send the computed stylus position to a personal computer, however, claims 29 and 38 depend directly or indirectly on claims 20 and 31, respectively, and are therefore allowable over claims 20 and 31 for at least the same reasons, since any claim depending on a non-obvious claim is also non-obvious.

As to claims 30 and 39, the Examiner asserts that Ogawa teaches interpreting the determined stylus position (col. 7, lines 34-39). Strictly speaking, the invention of Ogawa does not interpret the stylus position. It provides a calculated 2-D stylus position, and can augment the stylus position for example with a discrimination of the particular surface color (col. 12 lines 5-11), determine thrust of the pointing tool with dependence on variable surface color of the pointing tool (col. 12 lines 51-58), convey writing pressure information via stylus LEDs (col. 14 lines 56-59), or indicate the position of a

switch on the pointing device by turning on and off LEDS in the stylus (col. 14 line 66 to col. 15 line 3), none of which are interpretations of the stylus position as they are based on non-position dependent attributes or conditions of the stylus.

Accordingly, reconsideration of the rejections under 35 U.S.C. § 102(b) is respectfully requested, and that the rejections of claims 1-4, 6, 8, 10-13, 15, 16, 18, 20, 21, 23, 26-32, and 35-39, as originally filed, be withdrawn.

2. Claim Rejections – 35 U.S.C. § 103(a)

According to 35 U.S.C. §103(a), a patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.

Claims 5, 25, and 34 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Ogawa in view of Brown et al (U.S. Patent No. 4,430,526, hereinafter referred to as Brown). According to the Examiner, Ogawa does not disclose that the stylus includes an erasing mode image target near an erasing end of the stylus. However, Figs. 2 and 3 of Brown teaches a stylus (30) has a writing mode near writing end of a stylus (32), an erasing mode near an erasing end of the stylus (31). Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the stylus of Ogawa to have an erasing mode as taught by Brown so as to provide pointing device which is capable of performing writing and erasing operation.

The Applicant respectfully disagrees. The stylus of Brown does not include an erasing-mode imaging target as in Burns. The stylus of Brown is an active stylus, which includes a switch at each end (elements 330 and 340 of Fig. 3) and an LED at each end (360 and 370 of Fig. 3). When a switch at either end is turned on, the respective LED is flashed at a particular rate that is detected by an external photodetector 121 located near an external video camera 125 (col. 6 lines 39-54 and Fig. 1). As described by Brown, "To erase a portion of the graphic, the conferee tilts erase end 31 downward towards the graphic with tip 33 depressed against that portion of the graphic to be erased. The

conferee simultaneously moves the tip of the erase end over all the pels [picture elements] comprising that portion, as if that end of the light pen was an ordinary pencil eraser" (col. 9 lines 2-8). The LED and switch of Brown at either the write end or the erase end of the light pen is incorrectly construed as an imaging target. The machine-vision target of Burns includes imaging targets such as coded bars, bands or crosses (paragraph 0047). Being passive, the writing-mode and erasing-mode imaging targets of Burns do not require batteries, LEDs, switches, circuitry or special photodetectors to be detected by the telemetric imager.

Claims 7 and 22 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Ogawa in view of Griffin (U.S. Patent No. 4,553,842, hereinafter referred to as Griffin). According to the Examiner, Ogawa does not disclose using one optical imaging array to generate the image of the stylus tip from the first and second directions. However, Fig. 2 of Griffin teaches using one optical imaging device to generate image of the input pointer from the first and second directions (detector assembly 28, col. 4, lines 5-26). Thus it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Ogawa to use one optical imaging detector as taught by Griffin so as to provide an optical position locating apparatus of simple low cost, easily maintained rugged construction (col. 2, lines 60-62 of Griffin).

The Applicant respectfully disagrees. According to Griffin, "The detector assembly 28 is comprised of a drive motor 36 which has a shaft 38 and a detector housing 40, which detector housing 40 is supported on the shaft 38 so that the detector housing rotates in response to rotation of the drive motor 36. Fixedly contained within the detector housing 40 is a photo-detector 42 (not an imager nor even a linear array), and formed in the wall of detector housing 40 is an aperture 44 (best seen in Fig. 6). Aligned with the aperture 44 and the photo-detector 42 and affixed to the detector housing 40 is a lens 46. The sensitive face 48 of the photo-detector 42 is a plane which contains the focal point 50 of the lens 46. A mask 49 is affixed to the sensitive face 48, which mask 49 provides a view-limiting aperture centered about the focal point 50 of the lens 46 to enhance resolution of detection of light interruptions by objects with the target zone 14. Thus, by rotating the detector housing 40 and its associated aperture 44 and lens 46, the

photo-detector 42 scans the target zone 14 for the presence of returning light, such as beams 34, and produces an electrical signal in response to the presence of such light, which signal is provided to and processed by external electronic circuitry" (col. 4 lines 5 to 27). By way of practical example, if a person were to draw four or more small circles on a sheet of paper, one would likely determine that about two circles could be drawn per second. With a minimal resolution of 11 points along each of two sides of the circle, the detector housing with the photodetector, as described by Griffin, would need to rotate in excess of (11 points per side) * (2 sides per circle) * (2 circles per second) * (60 seconds per minute) * (1 revolution per point) or 2,640 RPM, which a reasonable speed for a small motor, but would be prone to breakdown, misbalance and noisiness. This detection system is not a low-cost or reliable solution when compared to the telemetric imager of Burns.

To provide another illustration: a person closes one eye and with the other looks at his or her finger, which is near a mirror. The first image of the finger that the person sees is the direct image; the second image of the finger is a virtual image that appears in the mirror. From these two images, the position of the finger can be determined, even with just one eye. Without the mirror, however, the position of the finger cannot be uniquely determined. The optical position indicating apparatus of Griffin works in a manner similar to this example above. Although Griffin uses a single detector assembly 28, the device is dysfunctional without associated mirrors on the periphery, namely flat mirror 16, curved retroreflective mirror 18, and the echelon array of retroreflective mirrors 20 with retroreflector elements 24 and retroreflector strip 22 to generate the virtual image of an object (a shadow, actually) inside the target zone 14 (col. 4 line 28 to col. 5 line 21). This combination of mechanical, electrical and optical parts required by Griffin appears excessive to the Applicant and a suggestion that it makes the invention of Burns obvious fails to recognize the simplicity and solid-state nature of the telemetric imager, which does not require mirrors to operate.

Claim 9 has been rejected under 35 U.S.C. §103(a) as being unpatentable over Ogawa in view of Wood et al (U.S. Patent No. 6,414,673, hereinafter referred to as Wood). According to the Examiner, Ogawa does not disclose the writable medium comprising a sheet of paper. However, Wood teaches a stylus entry region comprising a

sheet of paper (e.g. col. 11, lines 10-24). Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the writable medium of Ogawa to have a sheet of paper as taught by Wood since this allows the user to draw or write on the writable medium such that both an electronic copy and a hardcopy is available as a record to the user at the same time.

While recognizing that the apparatus of Wood includes styli such as a marker that is however adapted with an ultrasonic piezoelectric output signal transducer 28 (Fig. 5, Fig. 6, Fig. 7 and associated text), the Applicant wishes to point out to the Examiner that with the method of Wood and other acoustic approaches to stylus detection, the z-height is not determinable uniquely with just two transducers in an x-y coordinate plane. Thus, without an additional aid, these acoustic approaches would not be able to tell when the stylus is off and when the stylus is down on the surface, and therefore a hard copy and an electronic copy of material being written would not be obtainable, since the system would need to know when the stylus tip is in contact with the surface as it is moved along a path under the control of a user. As Wood puts forth in Fig. 4 and associated text, a third transducer can be used to obtain three-dimensional coordinates. However, sensitivity calculations show that detection of the z-height from a coordinate plane with three transducers in the plane is diminished as the stylus tip approaches the coordinate plane. Non-planar positioning of the three transducers offers an alternative, though not an attractive one due to the need for an additional transceiver and the awkward configuration issues with a third transducer being displaced away from the surface.

Wood provides a solution to the problem regarding pen up / pen down and other secondary information to the receivers via modifications to the basic waveform to indicate different signal states. Examples of modifications are adding two waveform pulses 72a and 72b to indicate a pen down position and adding a single ultrasound pulse 72a to designate a pen up position (col. 11, lines 2-9). To initiate the waveform modifications, an internal switch or similar mechanism is needed inside the stylus of Wood. Unlike that of Woods, the system of Burns requires no active sensor or transducer in the stylus. The telemetric imager and controller of Burns determine the stylus position based on generated images of the stylus tip, which can be processed to determine an up or down position for accurately generating writing information without any active

components in the stylus. Indeed, the invention of Burns allows even a $0.05 pencil or pen to be used as the stylus, and allows the user to write as desired on a writable medium such as a conventional sheet of paper or a pad of paper placed in the stylus entry region.

Furthermore, combining Wood with Ogawa still requires the shield of Ogawa around the writable medium, presenting a rather clumsy configuration for the general user.

Claim 17 has been rejected under 35 U.S.C. §103(a) as being unpatentable over Ogawa in view of McDermott et al (U.S. Patent No. 5,635,683, hereinafter referred to as McDermott). According to the Examiner in regards to Figs. 1, 21 and 24 of Ogawa, Ogawa teaches a communication port connected between the controller and a digital computing device (5). Ogawa does not explicitly disclose the communication port is one of a wired or a wireless port. However, McDermott teaches a controller (processor 18 in Fig. 1) connected to a digital computing device (host computer 16) via a wire or wireless link (e.g. col. 9, lines 48-51). Thus it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Ogawa to use a wire or wireless communication link for connecting the controller and the computing device so as to readily transmit information from the controller to the computing device.

The system of the Applicant and the apparatus of Ogawa in view of McDermott can send the computed stylus position to a digital computing device, however, the apparatus of Ogawa with separated detecting units needs one more communication port to connect the left-hand detecting unit to the right-hand detecting unit (Ogawa, col. 7 lines 48-62). Furthermore, claim 17 depends directly or indirectly on claims 16 and 1, and are therefore allowable over claims 1 and 16 for at least the same reasons, since any claim depending on a non-obvious claim is also non-obvious.

Claim 19 has been rejected under 35 U.S.C. §103(a) as being unpatentable over Ogawa in view of Yoshida et al (U.S. Patent No. 5,401,917, hereinafter referred to as Yoshida). According to the Examiner, Ogawa does not disclose a stylus holder formed within the housing and receives the stylus for stylus storage. However, Fig. 1 of Yoshida teaches a housing of pen input device having a stylus holder (3) formed within the housing and receives the stylus (5) for stylus storage. Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the

system of Ogawa to have a stylus holder as taught by Yoshida so as to allow stylus to be easily inserted and extracted thereto and the stylus being held in a stable manner when inserted inside (col. 1, lines 13-15 of Yoshida).

The Applicant wishes to point out to the Examiner that the stylus holder 72 of Burns (Fig. 2) may serve as a penwell to hold and store the stylus, not requiring the locking and clasping mechanisms of Yoshida. The system of the Applicant and the apparatus of Ogawa in view of Yoshida can provide a stylus holder formed within the housing, however, claim 19 depends directly or indirectly on claims 1 and 18, and are therefore allowable over claims 1 and 18 for at least the same reasons, since any claim depending on a non-obvious claim is also non-obvious.

Claims 14, 24 and 33 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Ogawa in view of Badyal et al (U.S. Patent No. 6,151,015, hereinafter referred to as Badyal). According to the Examiner, Ogawa teaches a controllable light source positioned near the telemetric imager (see Fig. 22), and a first set of images of the stylus tip from the first direction and the second direction are generated with the light source on, and wherein a second set of images of the stylus tip from the first direction and the second direction are generated with the light source off. Ogawa also teaches using the first set of images and the second set of images to determine the stylus position (col. 11, lines 11-35). Ogawa does not disclose comparing the first set of images and the second set of images to determine the stylus position. However, Badyal teaches a computer pointing device comprising optical sensor for capturing images, the newly capture image is compared with previously capture image to determine the stylus position (col. 4, lines 14-20). Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system of Ogawa to have a comparator as taught by Badyal to ascertain the direction and amount of movement.

The Applicant respectfully disagrees with the Examiner's comments. First of all, the cited reference in Ogawa (col. 11 lines 11-36) does not teach using the first set of images and the second set of images to determine the stylus position. Closer inspection shows that the "use of the shutter capability of the image sensor allows the illumination to operate in a flashing manner to pick up the image of the finger or the stylus only in a flash-on time, thereby minimizing the period in which extraneous light may impinge on

the detecting units. This constitution in turn minimizes undesirable influence of the display light and the extraneous light" (col. 11 lines 30-36). The light source of Ogawa is used in synchronization with the shutter gate; that is, one light source is on when the corresponding shutter gate of the optical detector is on and is off when the shutter gate is closed, essentially to avoid the illumination from one of the light sources being picked up by the opposite detecting unit. This is substantially different from the approach of Burns, where one set of images taken with the light source on is subtracted or otherwise compared to a second set of images with the light source off, to increase the contrast of the images and reduce the impact of background lighting. Secondly, the pointing device of Badyal, while capable of detecting movement, is not capable of determining position as in Burns. Detecting movement is not the same as detecting a position; detecting movement is detecting changes with respect to a previous position. Thirdly, additional elements are required in the stylus of Badyal to illuminate and detect spatial features of a work surface below the tip, and to determine when the stylus is in contact with a surface. For example, the pointing device of Badyal requires "a switch 106 or other contact detector to determine when the tip 122 is in contact with the work surface ... the path of the pointing device should only be recorded when the tip of the pointing device is in contact with the work surface" (col. 4, lines 53-65). Furthermore, "Lens 110 and optical motion sensor IC 108 are disposed within the pointing device" (col. 3 line 29-30), and therefore requires an active stylus. The Badyal device does not generate images of the stylus tip to determine the stylus position; rather the optical motion sensor IC 108 in conjunction with lens 110 generates images of the work surface in front of the pointing device (see Fig. 1) rather than of the tip itself. Furthermore, no reference can be found that the light source of Badyal is controllable. To detect minute texture changes of a work surface as the pointing device is moved, the illumination source 104 is on continuously and it is the work surface that needs to be lit, not the stylus tip. According to Badyal, "The tip 122 or some other portion of the body 102 of the pointing device is translucent. This allows light from the illumination source 104 disposed within the pointing device to exit the pointing device" (col. 3 lines 22-26). Previously and newly captured images of Badyal are both taken with the light on, not one with the light on and the other with the light off. To summarize, the physical location of the motion sensor in

the stylus, the requirement of an active stylus, the additional components such as switches and lenses in the stylus, and other reasons presented above do not make obvious the invention of Burns when Badyal is combined with Ogawa.

Based on the above arguments, reconsideration of the rejections under 35 U.S.C. § 103(a) is respectfully requested, and that the rejections of claims 5, 7, 9, 14, 17, 19, 22, 24, 25, 33, and 34, as originally filed, be withdrawn.

3. *Summary*

For the above set forth reasons, the Applicant respectfully submits that all of the claims in the application define over and are neither anticipated nor made obvious by the cited art, and that claims 1-39 herein fully satisfy the requirements of 35 U.S.C. §§ 102, 103 and 112. In view of the foregoing, favorable consideration and prompt passage to issue of the current application is respectfully requested. If any points remain in issue that may best be resolved through a personal or telephonic interview, the Examiner is encouraged to contact the undersigned at the telephone number listed below.

The Applicant, whose telephone number is (408) 729-6375, welcomes phone contact with the Examiner to discuss the contents of this request for reconsideration before a formal, written action is prepared.

Respectfully submitted,

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